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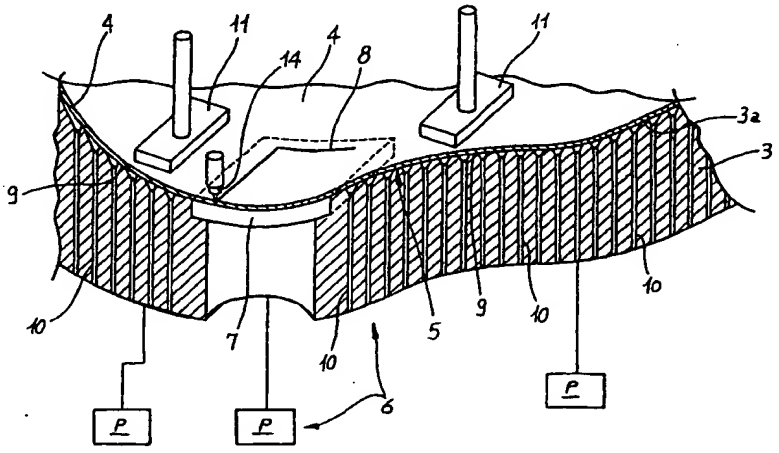

(57) Abstract

It is provided an apparatus for treating leather materials intended for covering motorcar dashboards provided with invisible airbags, in which a supporting base (3) receives the leather material to be submitted to treatment on an upper surface thereof, in such a manner that said leather material has one side resting on the base which corresponds to the visible side of the material in a three–dimensional sheet (4) when said dashboard is covered with it and a free side intended for being concealed under the same dashboard–covering conditions. A work head (12) carrying a cutting tool operates on the sheet material (4) for making a weakening line of predetermined depth thereon. The operating surface of the supporting base (3) has a three–dimensional extension the shape of which substantially matches that of the corresponding surface of the dashboard to be covered with the leather material. The apparatus enables precise scores to be made even on surfaces having a strong three–dimensional extension.

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APPARATUS AND PROCESS FOR TREATING SHEET MATERIALS INTENDED FOR COVERING MOTORCAR DASHBOARDS PROVIDED WITH AIRBAGS, IN PARTICULAR INVISIBLE AIRBAGS

Description

The present invention relates to an apparatus and a process for treating sheet materials intended for covering motorcar dashboards provided with airbags, in particular invisible airbags.

It is known that one of the problems relative to installation of an airbag on a car is connected with the fact that the housing holding the inflatable device is required to be made invisible.

In addition to the above requirement which is essentially of an aesthetic character there is also the necessity to create weakening lines in the dashboard structure, at the dashboard regions corresponding to the airbag housing, which lines must be exactly defined and established a priori in such a manner that they may enable an excellent operation of the device.

In order to pilot opening in a correct manner, portions intended for covering and concealing the airbag device are such shaped that they are provided with weakening regions or with regions where there is no material, along the separation lines, thereby promoting opening of the same in a controlled manner.

Usually covering panels consist of an inner layer of foam material optionally reinforced with one or more rigid insert pieces, over which a thin layer of synthetic leather is applied.

Generally weakening of the panel structure is carried out by suitably scoring the foam material and/or weakening the rigid insert pieces therein contained.

It is also known that scores can be made in the covering layer in order to prevent tearing thereof and avoid arising of anomalous deformations in the leather material and a non-instantaneous or uneven coming out of the airbag, as well as the possibility of spreading leather portions and the consequent impact of these portions on people within the driver and passenger compartment.

Formation of these scores on the inner surface of the covering layer however is correlated with a great number of problems.

In fact, it is apparent that if a score should be too deep the visible surface of the dashboard could be impaired and unaesthetic cuts in the leather material could even appear at some regions. (US Patent No. 5082310).

In addition, should too strong a pressure be exerted during the cutting operation or too much material be removed, the visible leather surface would be marked too.

Under situations of the above type it is apparent that the marked leather sheet should be discarded, which would involve loss of materials and slowing-down in the production rates.

An apparatus has been recently accomplished for treating leather material intended for covering dashboards, in which the leather-cutting blade has two spacer elements integral therewith at the cutting end and more particulary two rollers intended for maintaining a

predetermined insertion depth of the blade into the leather material.

Practically, during the cutting operation the leather sheet is laid down over a supporting surface and the blade penetrates through the covering layer until the rollers abut against the outer surface of the sheet material.

During the whole cutting operation rollers substantially ensure a constant scoring depth.

A first drawback highlighted by this device is connected with the fact that too much pressure on the cutting tool causes a compressive strain in the leather material thereby increasing the cut depth and giving rise to leather tearing.

In order to overcome this drawback, in the known art it is provided that a flat layer of material having a greater compressive strain than the leather material should be put under the leather sheet. In this way pressures exerted on the cutting tool will tend to be discharged onto the less rigid layer and deform it to a greater extent.

While the known art briefly described above enables scores having a better finish to be made in the leather sheets than in the cases in which scores uncontrolled in depth are made, it suffers from many drawbacks as well.

Firstly, it is to note that known devices are unable to make precise scores and to adopt reliable systems for making them when greatly three-dimensional dashboard structures are involved.

It is in fact apparent that this type of leather is not suitable for being laid down on a surface. Even if this first step of the scoring process were made using presser pads, it is apparent that such deformations and stresses would be generated in the leather structure laid down on a surface that the scoring finish would be impaired.

In addition, regions having a strong gradient of spatial variation as herein present hardly lend themselves to interposition of rubber materials for absorbing compressions of the cutting tool. In fact, if the tool pressure should not be directed perpendicularly to the surface to be cut, deformations and sliding actions created between the leather sheet and the support cause the score not to be very precise and the cut may pass through the whole leather layer.

Furthermore, it is to note that both execution of a too deep score and removal of too much material in the case of a V-shaped cut or notch, as well as too much pressure can also cause the appearance of visible and undesired marks on the outer surface of the dashboard. On the other hand, execution of insufficiently deep scores or notches can give rise to wrong opening of the airbag.

The incapability of obtaining a high accuracy in scores is also due to the absence of appropriate fastening systems between the leather sheet and the locating surface.

Then, the presence of mechanical means alone for controlling the score depth does not make it possible to detect whether the exerted pressure is too high or to ascertain the real contact of the locating rollers.

Therefore the present invention aims at substantially solving all the above mentioned drawbacks.

Within the scope of this technical task it is an important object of the invention to provide an apparatus for making scores in sheet materials intended for covering dashboards, capable of executing exact and accurate scores on three-dimensional structures with a strong gradient of spatial variation.

It is a further object of the present invention to offer a control on the score depth not only of the mechanical type, but also capable of evaluating the score depth instant by instant and avoiding any problem connected with exerting too much pressure at the score region.

An auxiliary object of the invention is then to avoid material removal (as it may happen with a V-shaped score or notch) by cutting the leather sheet in such a manner that the notch flaps are left close to each other, and the presence of recognizable marks on the visible surface of the dashboard is eliminated as much as possible.

The foregoing and further objects that will become more apparent in the course of the present description are substantially achieved by an apparatus for treating sheet materials intended for covering motorcar dashboards provided with airbags in accordance with the appended claims.

Further features and advantages will become more apparent from the detailed description of a preferred non-exclusive embodiment of an apparatus for treating sheet materials in accordance with the present invention. This description will be taken hereinafter with reference to the accompanying drawings given by way of non-limiting

example, in which:

- Fig. 1 is an elevation side view of a work head associated with an apparatus for treating sheet material in accordance with the present invention;
- Fig. 2 is a diagrammatic plan view of an apparatus in accordance with the invention;
- Fig. 3 shows the supporting base of the apparatus referred to in Fig. 2;
- Fig. 4 is a cross-section view of the cutting tool active on the sheet material shown in Fig. 3; and
- Fig. 5 shows an alternative embodiment of a work head active on the sheet material at two operating positions.

With reference to the drawings, an apparatus for treating sheet materials intended for covering motorcar dashboards provided with airbags has been generally identified by reference numeral 1.

As can be viewed from the accompanying Fig. 2, the apparatus is provided with a fixed bearing structure 2 over which one or more supporting bases 3 can be engaged for receiving a sheet material 4, to be submitted to working operations, on an operating surface 3a thereof defined on top.

The upper surface 3a of the supporting base 3 (see the representation in Fig. 3 in particular) has at least one locating portion of three-dimensional extension the shape of which substantially matches that of a corresponding surface of the dashboard to be covered with the sheet material 4.

In particular, the shape of this operating surface will substantially match that of the finished product, i.e. a dashboard to which the leather covering has already been applied and will be also made of materials adapted to

give it the appropriate rigidity.

Preferably the locating portion 5 of three-dimensional extension will extend not only at the region where a score will be executed, but also at a surrounding region in order to enable a better positioning and engagement of the sheet material.

The sheet material too will be provided with a three-dimensional-extension conformation capable of facilitating its adaptation to, and positioning on the locating portion 5 with which it is to be engaged. In other words, already in this working step the shape of the leather sheet will match that of the motorcar portion to be covered with it.

Fastening of the sheet material to the supporting base is obtained by pneumatic locking means 6 involving suction and active on the base itself for securing sheet 4 to the upper operating surface 3a as uniformly as possible.

In greater detail, base 3 has a first portion 7 substantially disposed at the region where the weakening line 8 is to be formed, which is made of a porous material, suitably-worked aluminium for example.

The porous-material portion 7 performs a dual function: it forms an as much as possible continuous (i.e. devoid of discontinuities due to holes or scores) support and, through appropriate sucking, enables locking of the portion to be submitted to working with a uniformly-distributed force.

The supporting base 3 then comprises a second portion 9 arranged peripherally of the first portion and having a predetermined number of through suction channels 10

suitably distributed over the whole surface and associated with a suction device "p" being part of the pneumatic locking means 6.

It is to note that the pneumatic locking means 6 consists of said suction device "p" which is active on at least the first porous-material portion 7 and preferably on the second portion 9 too, by means of through suction channels 10.

At all events it is apparent that, depending on the type of scores and/or dashboards to be obtained, provision may be made either for a single suction device active on one and/or the other of said two portions, or for two or more separated suction devices.

In order to eliminate any possibility of displacement of the sheet material 4, mechanical locking means 11 may be provided as well, and it preferably consists of one or more bumpers of appropriate shape moved by respective actuators (not shown) and operating by a thrust action on the free side of the sheet material 4 to be treated. As can be viewed from Fig. 3, bumpers 11 are preferably positioned at a portion immediately surrounding the region on which notching or scoring is to be executed.

Fig. 1 shows a work head 12 operatively active on the sheet material 4 to make at least one weakening line 8 of predetermined depth thereon.

Since an invisible score is required to be made on the finished product, the sheet material has a resting side 4a (Fig. 4) bearing against the base 3 which corresponds to the visible leather side when covering of the dashboard has been carried out and a free side 4b (Fig. 4), in which the score is made and which is intended for

being concealed when the leather sheet covers the dashboard.

The work head 12 is provided with means 13 for holding and moving a cutting tool 14, which means is arranged to move said tool along the predetermined weakening line 8.

For carrying out the last-mentioned operation, the head work 12 comprises a control unit 30 active on the holding and movement means 13 to move tool 14 while keeping an active end 14a thereof to a preferably constant distance, preestablished for each point, from the locating portion. The head work 12 also moves tool 13 in a path which, point by point, is a function of the geometry of the supporting surface.

Preferably the control unit 30 will be able to be programmed and therefore will be provided with a memory block 31 carrying previously stored data or capable of, by an input interface 32, storing data 33 containing information relative to the geometry of the surface to be scored, the shape of the score to be carried out, and the score depth at the various points of the line.

The control unit 30 will also comprise a central processing unit 34 capable of reading the information and data from the memory block 31 and controlling, through appropriate actuators, the movements of the holding and movement means 13 for execution of the received instructions.

In particular, the holding and movement means 13 must enable the cutting tool 14 to carry out displacements in at least three main axes independent of each other, i.e. for example (this reference is not limited to the drawings) rotation about axes 15 and 16 and translation

along axis 17, in order to achieve movement of the cutting tool 14 in a plane tangential and/or orthogonal to the locating surface.

In addition, the holding and movement means 13 also enables rotation (denoted by arrow 18 in Fig. 1) of blade 14 around a fourth axis parallel to the blade 14 plane, preferably vertical and coincident with the translation axis 17, and possibly around a fifth rotation axis 19 parallel to the blade plane and preferably horizontal (see representation in Fig. 5).

A rotation about the vertical axis 17 is substantially required in that the cutting tool is provided with a flat blade that must always be displaced with its cutting profile along the direction tangent to the weakening line 8.

This means that for each variation in the direction of the weakening line 8 there is, during the working step, an appropriate rotation around axis 17 (arrow 18) of the cutting tool 14.

On the contrary, the fifth horizontal rotation axis is needed because the inventive apparatus can be also used for making scores either on leather sheets for dashboards with which a layer of foam material has been previously associated or on leather sheets of high thickness. It is apparent that under this situation the thickness to be cut is greatly increased and, when surfaces of great three-dimensional conformation are concerned, it is necessary for the blade carrying out scoring to penetrate into the material in a direction orthogonal to the surface of the sheet material (see Fig. 5).

From a structural point of view, the work head 12 (a

"Yamaha" robot of the "scara" type, for example) may consist of a support block 20 from which a first arm 21 branches off which has a horizontal extension and is rotatably associated according to a vertical axis to the support block itself.

Associated with the opposite end 21b of the first arm 21 is a first end 22a of a second arm 22 which has a substantially horizontal extension too, is movable in rotation relative to the first arm and carries the cutting tool 14, at its opposite end 22b.

There is also a motor (electrically and/or pneumatically operated) which is associated with the cutting tool 14 and is capable of making the tool carry out translations in the substantially vertical axis 17 to move the blade close to and away from the sheet material.

The work head further comprises a tool carrier associated with the head, from which the blade comes out and projects to a minimum degree in order to avoid bending problems during the cutting operations.

The apparatus is also provided with positioning-control means 35 for the cutting tool and the supporting base.

In particular, the base 3 and cutting tool 14 positioning-control means comprises at least one video camera having an optical reading axis inclined at 45° relative to the horizontal main axes of the work head.

Such an arrangement will enable positioning of the components to be verified relative to the vertical axis and both the horizontal axes.

The video camera also has the function of controlling

both the real presence and the precise vertical arrangement of the blade axis.

The central processing unit (CPU), after receiving data from the video camera, will be able to send appropriate signals to the user by audio or video alarm means 36 and cause immediate stopping of the work head 12 if the base or tool positions do not fall within the preestablished value gaps.

The CPU 34 will further carry out storage into the memory blocks 31, for each scoring and consequently for each leather sheet submitted to working, of the data detected by the video camera 35 and the executed cutting program.

If wished, the CPU 34 will be also able to carry out recording of data as regards the blade 14 position at predetermined intervals during the cutting cycle, by use of appropriate transducers 37 such as encoders to be associated with each of the movable axes of head 12.

The CPU 34 will also send a further signal to the alarm means, should the relative distance between the blade tip and the base be varied, due for example to wear of the blade itself, and will also automatically operate the new correct positioning of the blade.

It is to note that the video camera carries out the control and verification operations as regards positions at least at the beginning of each cycle and at the end of each cycle on each leather sheet.

Therefore, use of the video camera appears to be advantageous in that it enables both recording of the tool-base gauging at the beginning of the cutting operation, and verification of the correct positioning

once working has been carried out.

It is also apparent that the control means is to be positioned at an area as much as possible close to the cutting point so as to have a good optical access, while at the same time not interfering with the movements of the cutting head and with the mechanical locking bumpers.

After the above description, operation of the apparatus being the object of the present invention is as follows.

A supporting base of three-dimensional extension is arranged, the shape of which substantially matches that of the dashboard surface to be covered with the leather material, and position thereof is verified by the video camera.

Once the correct positioning of the leather sheet has been carried out, through the pneumatic locking means a vacuum is generated so that the leather sheet is locked in place and lowering of pressers intended for further mechanically blocking the area surrounding the scoring region is caused.

Then the work head cycle is started and it involves a first step in which protections around the apparatus are closed and the base and tool positions are controlled and possibly recorded.

If the position of the components appears not to be within predetermined parameters, a signal is sent from the central unit which is capable of stopping movement of the work head.

If positioning of the blade tip relative to the base is, on the contrary, inexact within given tolerances due to

the cutting tool wear, the CPU operates a relative repositioning of said components. In case of a correct position, the cutting operation is started.

Once the weakening line has been made according to the desired depth, a further control and a further recording of the base and tool positions is carried out, then the work head goes back to its cycle-starting position and the treated leather sheet is discharged.

Optionally, the CPU may also record the work position of the blade, and the leather and supporting base positions during the leather-cutting step.

At the end of each cycle a blowing step carried out through the suction holes and the porous material may be also provided in order to remove the leather sheet from the base and clean the possibly closed suction holes.

The invention achieves important advantages.

In fact, use of a supporting base of a rigid material the shape of which substantially matches that of the dashboard surface enables scores of high precision to be done in the leather sheet even in the case of sheets having a three-dimensional extension.

Due to the presence of control means for the relative positioning between cutting tool and supporting base, the correct parameters at the beginning and at the end of the scoring operation can be verified during each working cycle, thereby ensuring constancy and precision in cutting.

It is also apparent that the apparatus enables both the score typology to be varied (making U-shaped or H-shaped

notches, for example) by modifying the parameter inputs contained in the memory block, and the concerned dashboard type to be varied by merely replacing the supporting base and resetting the control data of the trajectory which is a function of the geometry of the new supporting surface.

The invention is also advantageous in its secondary aspects.

Control on the positioning of the supporting base and tool enables the relative positioning between blade and leather sheet to be verified and possibly adjusted (which operation is necessary in case of wear of the materials), and also stopping of the apparatus to be operated, if given positioning parameters were not respected. The whole is carried out with completely automated operations.

The same means also enables the production history of each leather sheet being treated to be recorded.

In addition, use of a thin blade moving on and carrying out working always with its tip avoids material removal and therefore does not produce any visible mark on the surface in sight of the dashboard.

The presence of leather flaps disposed perfectly close to each other also avoids generation of non-homogeneous leather regions on application of the layer of foam material.

C L A I M S

1. An apparatus for treating sheet materials intended for covering motorcar dashboards provided with airbags, in particular invisible airbags, said apparatus comprising:
- a fixed bearing structure (2);
- at least one supporting base (3) in engagement with the fixed bearing structure (2) and intended for receiving a sheet material (4), to be submitted to treatment, on an operating surface (3a) thereof, said sheet material having a resting side (4a) bearing against said base which corresponds to the visible side of the sheet material (4) when said dashboard is covered with it and a free side (4b) intended for being concealed under the same dashboard-covering conditions; and
- a work head (12) operatively active on the sheet material (4) for making at least one weakening line (8) of predetermined depth thereon, characterized in that said operating surface (3a) of the supporting base (3) has at least one locating portion of three-dimensional extension the shape of which substantially matches that of a corresponding surface of the dashboard to be covered with said sheet material (4).

2. An apparatus as claimed in claim 1, characterized in that the work head (12) comprises holding and movement means (13) for a cutting tool (14), which means is intended for moving the tool along said weakening line (8); and
- a control unit (30) operatively active on the holding and movement means (13) for moving said tool (14) while keeping one active end (14a) of the tool to a predetermined, preferably constant, distance from the locating portion and moving said tool following a trajectory that, point by point, is a function of the geometry of the supporting surface.

3. An apparatus as claimed in claim 2, characterized in that the holding and movement means (13) enables said cutting tool (14) to carry out displacements in at least three axes independent of each other for moving the cutting tool itself (14) tangentially and/or orthogonally of the supporting surface (3a).

4. An apparatus as claimed in anyone of the preceding claims, characterized in that said cutting tool (14) comprises a flat blade.

5. An apparatus as claimed in claim 4, characterized in that said holding and movement means (13) allows rotation of the blade around a fourth rotation axis (17) parallel to the lying plane of the blade itself and preferably vertical.

6. An apparatus as claimed in claim 5, characterized in that said holding and movement means (13) allows rotation of the blade around a fifth rotation axis (19) parallel to the lying plane of the blade itself and preferably horizontal.

7. An apparatus as claimed in anyone of the preceding claims, characterized in that it comprises pneumatic locking means (6) active on the supporting base (3) for securing the sheet material (4) to the operating surface (3a) of the supporting base (3).

8. An apparatus as claimed in claim 7, characterized in that said supporting base (3) comprises a first portion (7) substantially disposed close to said weakening line (8) and a second portion (9) disposed peripherally of said first portion, said pneumatic locking means (6) comprising a suction device (p) active at least on said first portion and, preferably also on said second

portion.

9. An apparatus as claimed in the preceding claim, characterized in that said first portion (7) of the supporting base (3) is made of a porous material.

10. An apparatus as claimed in claim 8, characterized in that said second portion (9) of the supporting base (3) comprises through suction channels (10) connected to said suction device (p).

11. An apparatus as claimed in anyone of the preceding claims, characterized in that it comprises mechanical locking means (11), preferably consisting of one or more bumpers moved by respective actuators and operating by thrust on the free side (4b) of the sheet material (4) to be worked.

12. An apparatus as claimed in anyone of the preceding claims, characterized in that it comprises positioning-control means (35) for said cutting tool.

13. An apparatus as claimed in anyone of the preceding claims, characterized in that it comprises positioning-control means (35) for said supporting base (3).

14. An apparatus as claimed in claims 12 and 13, characterized in that the positioning-control means (35) comprises a video camera capable of watching said cutting tool and said supporting base (3), the apparatus further comprising a central processing unit (34) inputting data from the video camera and operating alarm means (36) in case of wrong positioning of the tool and/or supporting base (3).

15. An apparatus as claimed in claims 12 and 13,

characterized in that the positioning-control means comprises a video camera capable of watching said cutting tool and said supporting base (3), the apparatus further comprising a central processing unit (34) inputting data from the video camera which is capable of detecting wear of the cutting tool and operating a relative new positioning between the cutting tool and the supporting base (3).

16. An apparatus as claimed in claim 2, characterized in that the control unit (30) comprises a memory block (31) in which data relative to the cutting tool (14) displacement along the weakening line (8) is present and a central processing unit (34) capable of reading this data (33) and operating the work head (12) for producing the weakening line (8) on the sheet material (4).

17. An apparatus as claimed in claim 16, characterized in that the positioning-control means (35) comprises a video camera capable of watching said cutting tool and said supporting base (3), and in that for each piece of sheet material the central processing unit (34) carries out storage in the memory block (31) of the data (33) detected by the video camera at least before and after accomplishment of the weakening line (8) and storage of a working program as carried out.

18. An apparatus as claimed in claim 17, characterized in that the central processing unit (34) also carries out storage in the memory block (31) of the data detected by the video camera at predetermined instants during the scoring operation.

19. A process for working sheet material (4) intended for covering motorcar dashboards provided with airbags, preferably carried out by the apparatus as claimed in

claim 1, said process comprising the following steps:
- arranging a fixed bearing structure (2);
- associating at least one supporting base (3) with the fixed bearing structure (2);
- positioning a sheet material (4) to be submitted to treatment on an operating surface of the supporting base (3) having at least one locating portion of three-dimensional extension, the sheet material (4) having one side resting on said base which corresponds to the visible side of the sheet material (4) when the dashboard is covered with it and a free side intended for being concealed under the same dashboard-covering conditions;
- making at least one weakening line of predetermined depth on the sheet material (4) by a work head (12).

20. A process as claimed in claim 19, characterized in that it further comprises a step of pneumatically locking the sheet material (4) by vacuum and/or a step of mechanically locking the sheet (4) by means of bumpers, which steps follow the step of positioning said sheet material (4).

21. A process as claimed in claim 19, characterized in that it comprises a step of controlling and recording the base (3) and cutting tool (14) positions, which precedes the step of making said weakening line (8), and a further step of controlling and recording the base (3) and cutting tool (14) positions, which follows the step of making the weakening line (8).

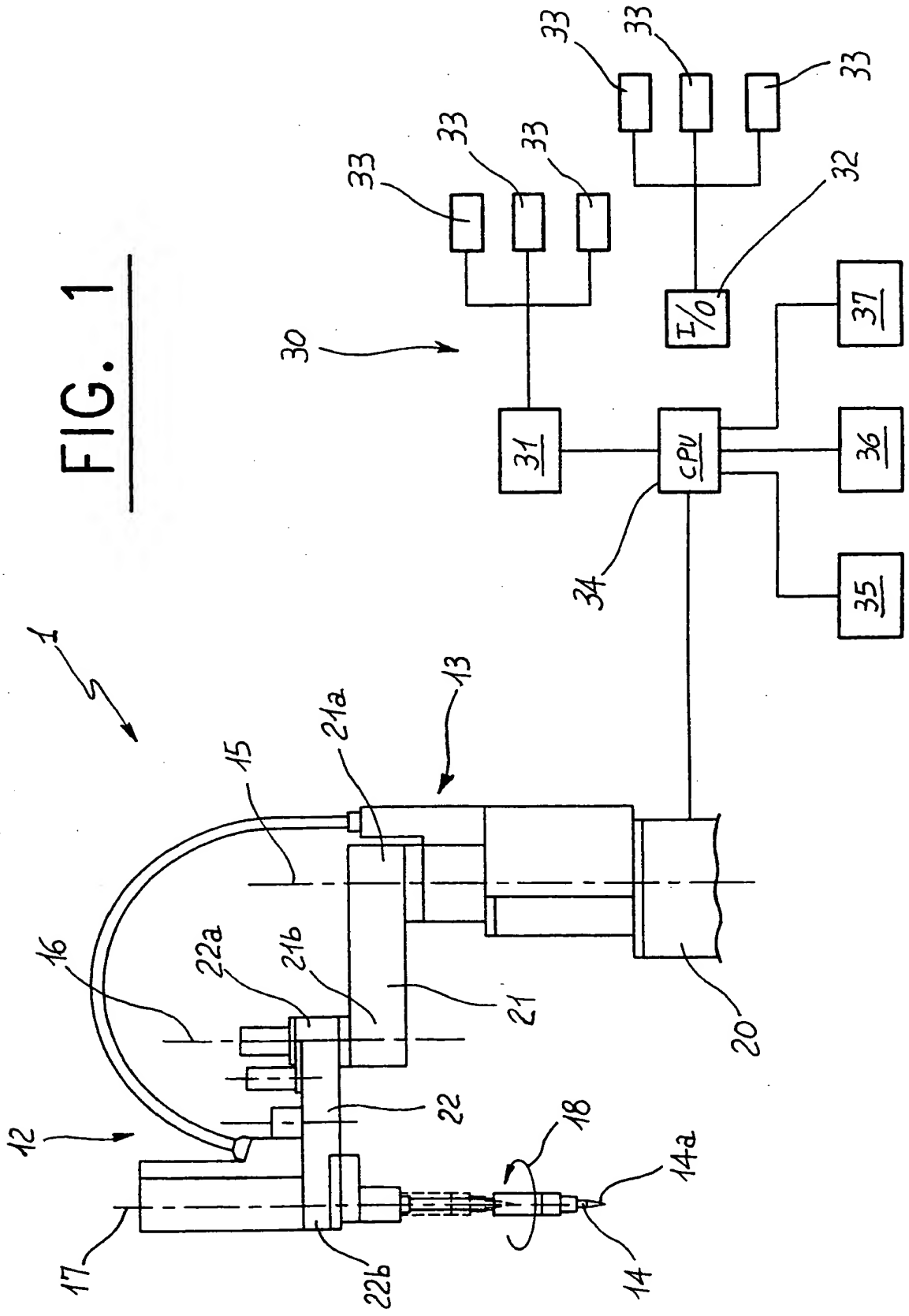
22. A process as claimed in claim 21, characterized in that it comprises further steps for controlling and recording the base (3) and cutting tool (14) positions which are carried out simultaneously with the step of making said weakening line (8).

23. A process as claimed in claim 19, characterized in that it further comprises a blowing step carried out through a porous material and the suction holes present in the supporting base (3).

24. A process as claimed in claim 21, characterized in that, during the control step preceding accomplishment of the weakening line (8), an optional step is provided for signalling an inaccurate positioning of the cutting tool (14) and the supporting base (3) and a simultaneous step of locking the work head (12).

25. A process as claimed in claim 21, characterized in that during the control step preceding accomplishment of the weakening line (8), an optional step is provided for automatic correction of the relative position between the supporting base (3) and the cutting tool (14).

FIG. 1



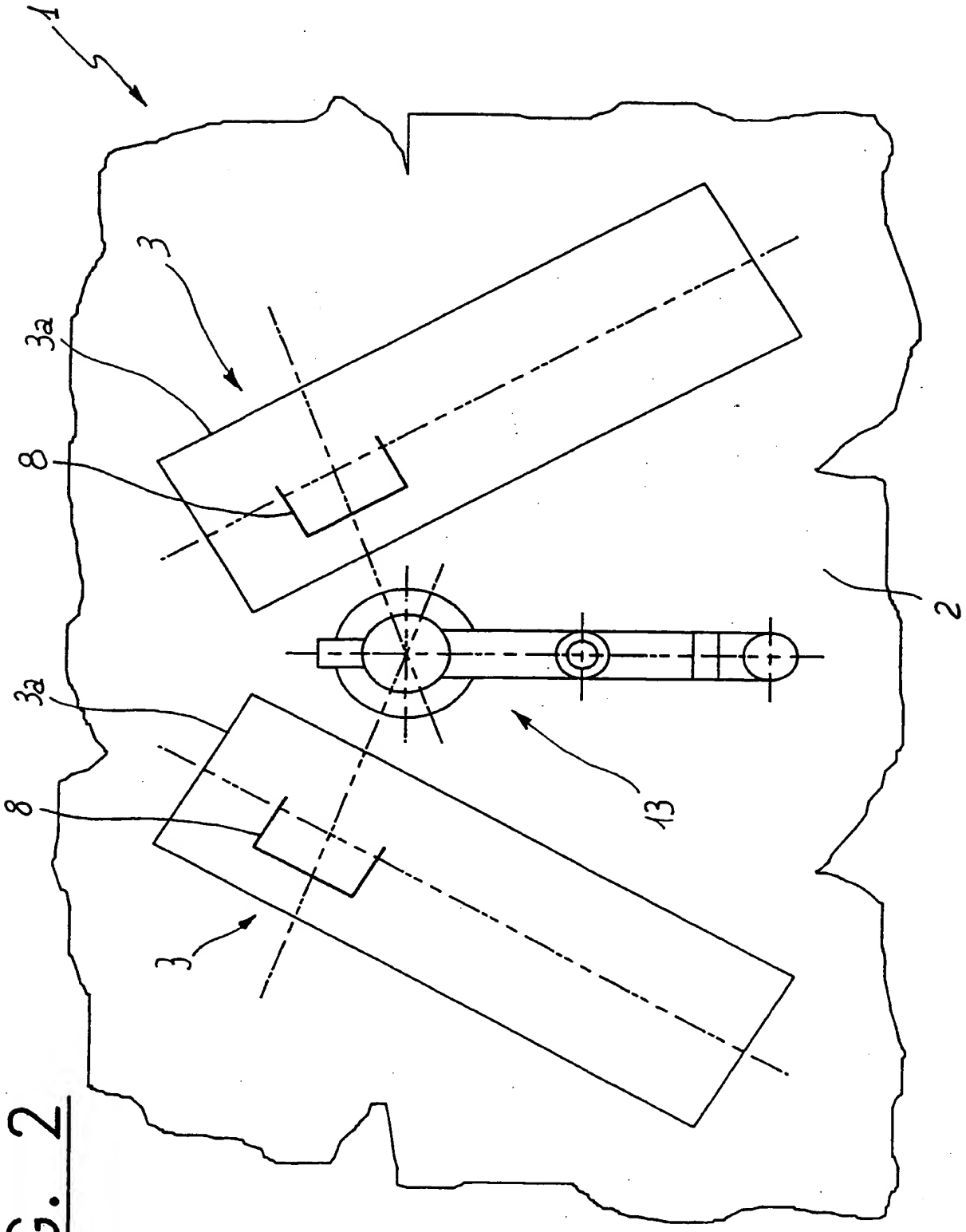


FIG. 2

FIG. 3

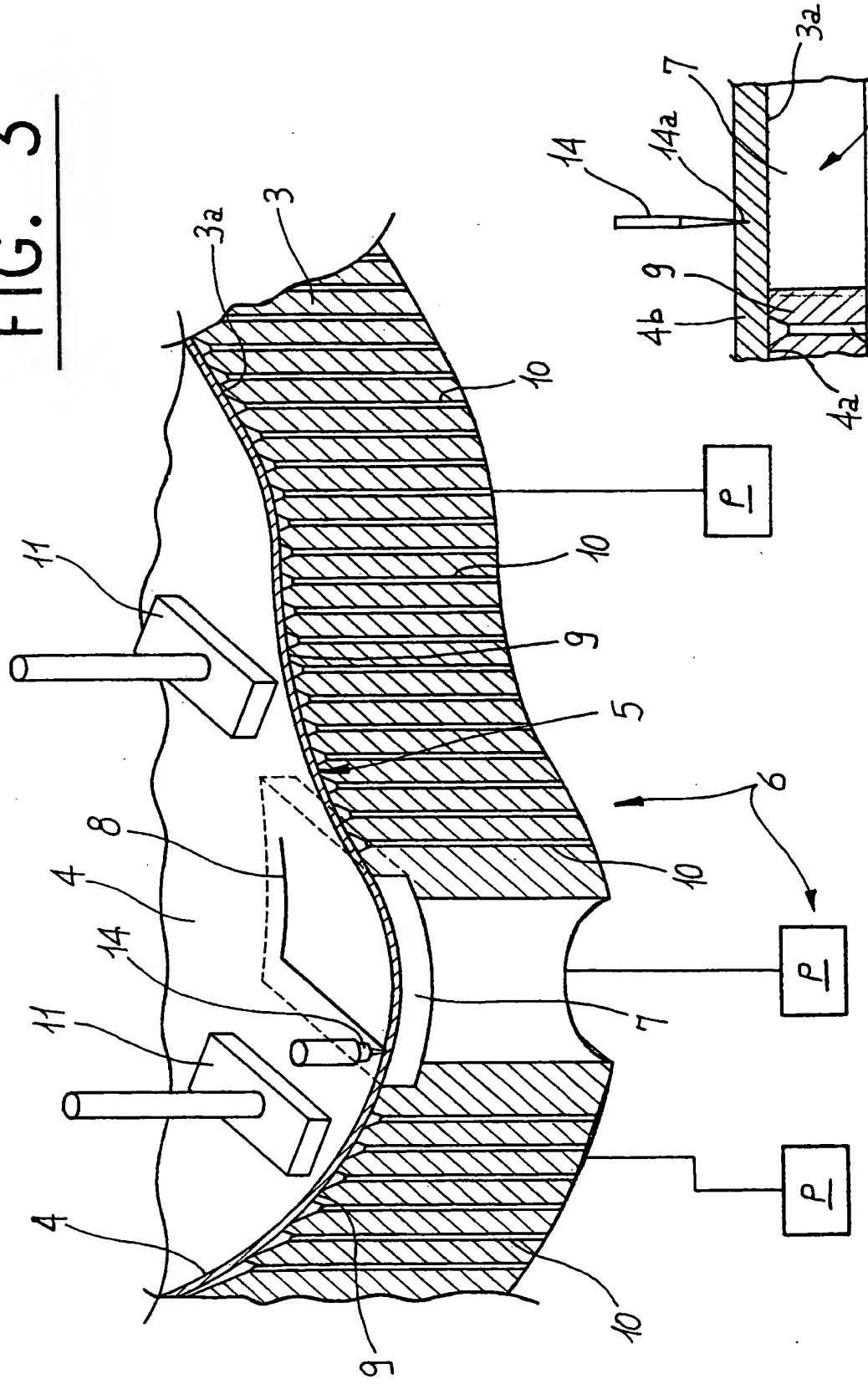


FIG. 4

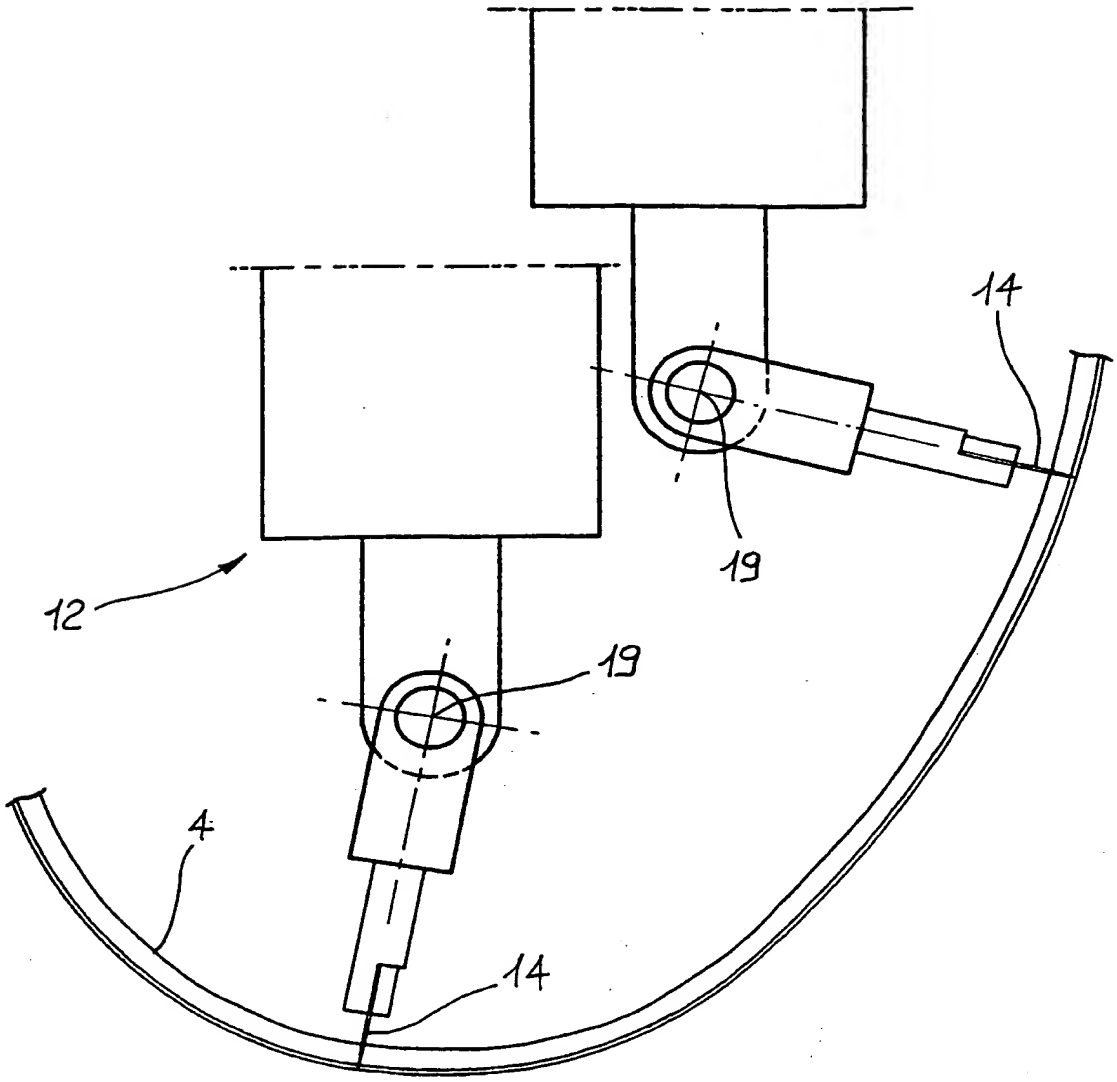


FIG. 5

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/IT 98/00347

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B26F1/38 B26D7/01 B26D5/00 B26D3/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B26F B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	CA 2 205 284 A (TIP ENG GROUP INC) 13 November 1997 (1997-11-13) the whole document	1-3,7-9, 11-13, 16,19,20 4-6,10, 14,15, 17,21-25
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Y	DE 298 13 528 U (HEINZ GAUBATZ MODELL UND FORME) 22 October 1998 (1998-10-22) the whole document	14,15, 17,21, 22,24,25

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
7 July 1999	14/07/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Vaglienti, G

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INTERNATIONAL SEARCH REPORT

Int. ional Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	DE 43 44 523 A (YMOS AG IND PRODUKTE) 20 July 1995 (1995-07-20) column 3, line 5 - line 42; figures	18
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